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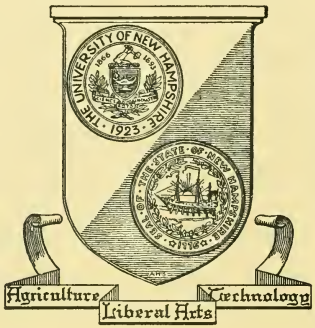


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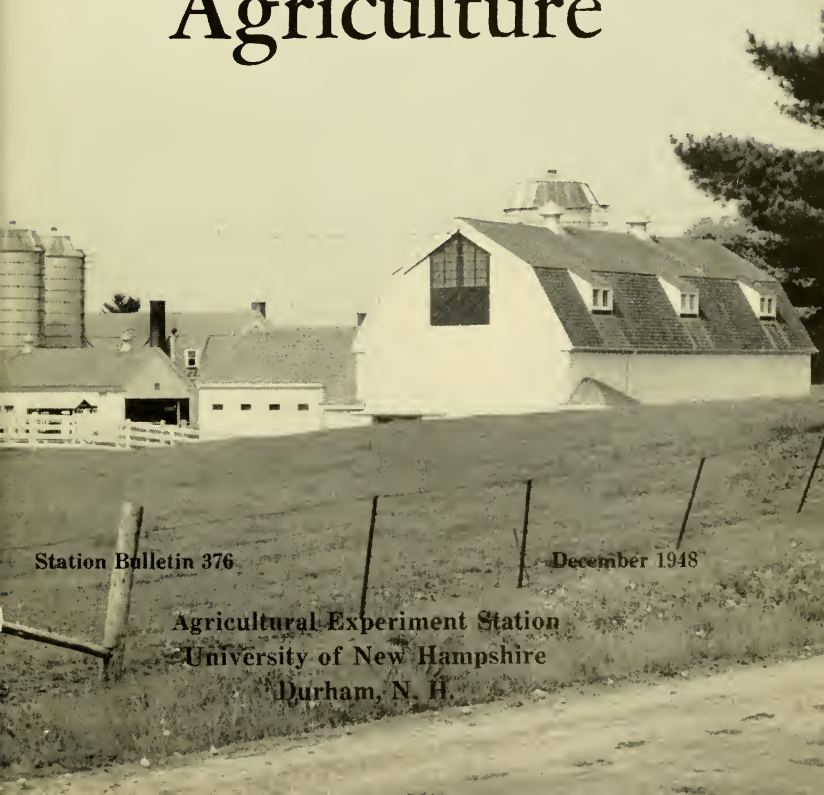

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Agricultural Experiment Station
University of New Hampshire
Durham, N. H.

# Annual Report

of the

# Director

of the

# Agricultural Experiment Station

# New Hampshire

1948

UNIVERSITY OF NEW HAMPSHIRE

DURHAM, N. H.

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## A Word from the Directors

This 60th annual report of the New Hampshire Agricultural Experiment Station is prepared to present to the people of the State and to other interested persons the results of our experimental work. A more complete presentation of the results of each project will be published later in scientific journals or as technical experiment station bulletins. An attempt has been made to increase the attractiveness of the report by omitting a discussion of those projects that have not yielded tangible results during the past year, by including numerous illustrations, and by attempting to present the conclusions of our work in a simple, direct manner, omitting any detailed discussion of the experimental procedure.

It is hoped that a report of this type will be read by many persons who are seeking a concise and accurate statement of the scientific knowledge that has been accumulated recently by the Agricultural Experiment Station. That an annual report be published is required by law; it is our desire to not only fulfill our legal responsibility but also to prepare this report in a readable form without detracting from its scientific accuracy. The extent to which this objective has been accomplished can only be judged by the reactions of those who read the publication. Your comments are heartily solicited.

More fundamental than the report, is the concept back of the work of the Agricultural Experiment Station. It is our obligation to discern the basic, fundamental problems that confront the rural people of New Hampshire, and to seek in our laboratories and experimental fields, the solution to these problems. We are anxious to exhibit maximum efficiency in this respect. Our staff attempts to maintain close contact with the agricultural industry by attending group meetings of farmers, by discussing their particular field of interest with the staff of the Agricultural Extension Service, and by keeping abreast of the newest developments at other experiment stations as well as commercial concerns that are doing research. In addition, we need to receive suggestions from individuals as well as agricultural associations expressing their views concerning the basic problems confronting the various agricultural industries of the State.

In reading this report, you will note that often a number of persons are working on a single project. This goes to show the complexity of the problems on which we are working. It is not uncommon, for example, to require the assistance of a plant physiologist, a soil scientist, a chemist, and an animal nutrition specialist on a single research project.

We wish to remind you who are citizens of New Hampshire that this Agricultural Experiment Station located on the University Campus belongs to you. We welcome you to the campus, and our staff stands ready to show you our laboratories, our barns, and our experimental fields in order that you may become better acquainted with the research program that is being conducted.

Robert F. Chandler, Jr.
Director

Harold C. Grinnell
Associate Director

# Agricultural Chemistry

*The Ascorbic Acid Content of Fresh and Frozen Berries.* Several varieties of strawberries have been analyzed for ascorbic acid and the fresh berries ranged from 28 to 102 mg. per 100 gm. Of those varieties that were tested, Narcissa, Fairfax, and Catskill proved to contain the largest amount. The same varieties, picked on the same day of the month from year to year, varied 20 to 30 mg. per 100 gm. in ascorbic content. The variation during a single season was also considerable for each variety and no single variety was highest throughout the entire growing season.

The ascorbic acid content of fresh red raspberries ranged from 14 to 35 mg. per 100 gm. Purple raspberries ranged from 11 to 23 mg. while the blackcaps were very low, ranging from 0 to 11 mg. The seasonal variation for raspberries was slight as compared with strawberries. Fresh, low-bush blueberries averaged 16 mg. ascorbic acid per 100 gm.; but holding these fruits in a refrigerator for 16 hours resulted in the loss of 70 per cent of the ascorbic acid. Significant losses on a 24-hour period also occurred in strawberries when held either at room temperatures or in a refrigerator. No such loss occurred with raspberries.

All varieties of strawberries lost ascorbic acid during storage at below-freezing temperatures. If sugar were not added, the losses ranged from 13 to 93 per cent. Strawberries frozen without hulling retained more of their ascorbic acid than did hulled berries.

Blueberries, frozen or canned, lost essentially all of their ascorbic acid during a six-months' storage period.

S. R. Shimer
H. J. Purinton

*The Digestibility of Timothy and Alfalfa Hays.* Ten samples of timothy hay and seven of alfalfa were received from various laboratories in this country where they had been used as the sole ration in digestibility and energy studies with cattle. On chemical analysis of these samples it was found that in both species the protein content was closely related positively with the digestibility of both energy and dry matter. If the two species were combined, this relation was not significant. Similarly in each species, lignin, crude fiber, and cellulose were related negatively to digestibility. The negative relation of lignin to digestibility was closer than that of either crude fiber or cellulose.

T. G. Phillips

# Agricultural Economics

*Marketing Hatching Eggs.* Over 60 per cent of the eggs produced in New Hampshire are sold as hatching eggs. Because of the importance of this commodity a study was conducted during the past year to determine certain practices in the industry and to study losses in handling and shipping.

A preliminary report shows that about 74 per cent of the hatching eggs sold were used to produce broilers and 26 per cent were used for flock replacement purposes. Of the broiler eggs, 75 per cent were shipped outside of New Hampshire. The rest were hatched in the State.

A study was made of the cases

being used to ship hatching eggs. The results showed, considering those situations encountered in the study, that 22 per cent were of the heavy wooden returnable type; 33 per cent were of the regular commercial wooden type (both new and secondhand); 35 per cent were secondhand paper cases and 10 per cent were in new paper cases.

The method of shipping hatching eggs was examined, and the survey indicated that 32 per cent were being shipped by rail, 67.7 per cent by truck, and only 0.3 per cent went by plane. In a check made on 10 lots of hatching eggs for truck shipment to Maryland, it was found that there was an average of six cracked eggs per case as packed for shipment. An average of 10.5 eggs per case were cracked between the farm and a Maryland hatchery About 18 per cent of this occurred between the farm and the terminal and 82 per cent between the terminal and the Maryland hatchery. In three lots shipped by rail to Florida, breakage averaged seven eggs per case in new fiber cases, 10 per cent in good used fiber cases and 27 per cent in heavy returnable cases. In one lot of new fiber cases shipped by air to Florida, breakage was less than three eggs per case.

Eggs with loose air cells did not hatch.

Need is shown for use of cases in better condition. One large shipper uses all new fiber cases while another reduces losses by careful packing and the use of good cases.

L. A. Dougherty and
A. M. Atwood

*Rapid Milking as a Means of Saving Time in the Dairy Barn.* The emphasis this year has been on problems involved in milking rapidly and easily. Numerous records taken this year indicate that some operators, following the timing pattern suggested last year by the leaders of this project, can milk cows at the rate of 2.2 man minutes per cow per milking. On the other hand, capable operators who are definitely interested in rapid milking and attempting to follow directions are not able to milk the entire herd quickly and easily.

Attention was directed to individual herds to determine why the operator failed to get good let-down and did not milk quickly. As an initial step in three herds, samples were taken from each quarter for biological testing and the udders of the cows were examined physically by the University Veterinarian. In one herd, where the operator milked 26 cows in 58 minutes, the tests indicated that the udders were normal and free of serious infection. There are not sufficient data available yet, but it is believed that healthy udders may be an important factor in rapid milking. In another herd the tests indicated that a large proportion of the udders were not normal. The operator was not able to milk the cows quickly. In spite of good milking technique, 82 minutes were required to milk 26 cows.

In several herds, the operators failed to get back quickly enough to the cow which was being milked. When the routine of milking was readjusted so that the operator got back to the individual cow and machine stripped for half a minute, most of the cows were milked within four minutes.

In one herd selected for study, two men, each with two single units, milked 27 cows in 76 minutes. Only one cow was milked out in less than five minutes and machines were left on five cows over 10 minutes.

Two weeks later, the milking routine was improved and the machines

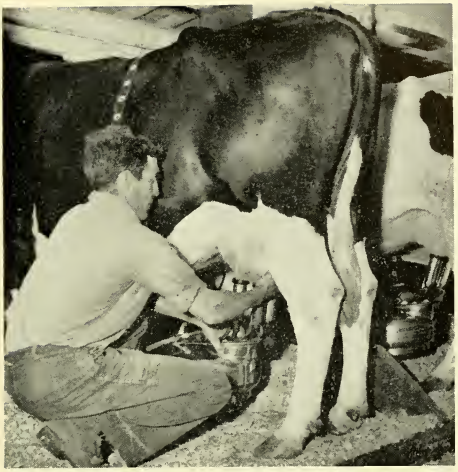


*Fig. 1—Rapid milking techniques save the dairy farmer much valuable time in doing his chores.*

were removed at the end of four minutes. All cows were hand stripped and the strippings weighed. Twenty cows were well milked out in four minutes. but eight were not completely milked. The next day the cows were rearranged so that the eight problem cows could be milked last. The machines were again removed from 20 cows in four minutes and the eight problem cows were then given special attention in preparation. The machines were removed in five minutes. Hand stripping revealed that all but three cows had milked out satisfactorily; thus, in this string of 28 "slow" milkers, there were only three real problem cows.

H. C. Woodworth,
K. S. Morrow, F. E. Allen,
L. W. Slanetz, and
Earl Elliott

*The New Hampshire Silage Cart Saves the Dairy Farmer's Time.* The New Hampshire silage cart illustrated in Fig. 2 distributes silage or chopped hay directly into the manger. This is done by means of a wide belt in the bottom of the cart which is turned by a hand crank as the cart is pushed along in front of the cows. A spindle on the inside breaks up the tendency for silage or hay to bridge over. It can be used to shake the feed down to the moving belt. The spindle also takes some of the weight off the moving belt at the bottom.

The door at the side is swung in and fastened when the cart is being loaded. Just before the cart is unloaded the door is swung out. This tends to release the weight and pressure on the wide belt so that the silage can be turned out easily. Approximately one minute is required to unload sufficient silage or chopped hay for 20 cows.

This cart was made in connection with a New Hampshire Agricultural Experiment Station project undertaken two years ago to study efficiency of chore practices in dairy barns. The cart is an adaptation of carts used by beef cattle feeders in

*Fig. 2—The New Hampshire silage cart. It distributes chopped hay directly into the manger. It can be used on modern farms for feeding chopped hay, corn silage, or grass silage.*

the Central West. By adding a wide belt and spindle the silage or chopped hay is fed out the side directly into the mangers. In feeding chopped hay, the capacity is increased by means of removable boards at the top.

Earl M. Elliott, field assistant working on rapid milking practices, built the cart in the Agricultural Engineering shops. George M. Foulkrod, agricultural engineer, Paul A. Gilman, applied farming instructor, and Wesley F. Brett, of the University work shop gave technical assistance.

*Idle Farm Land.* Many persons who are interested in the agriculture of New Hampshire and the other Northeastern states have indicated concern that farm lands remain idle and eventually revert to brush. The forces affecting land use in New Hampshire are quite complicated. Much land probably is better suited to forests than to farming, but some idle land may be better than some that is being farmed.

This study was initiated with the purpose of finding out how much idle usable farm land there is, whether or not owners are interested in using it, and if there are terms on which owners and operators can agree and which will permit good farming practices.

As the study has been in progress only since April 1, 1948, only a preliminary progress report is possible. A survey has been completed in the towns of Greenland and Stratham in Rockingham County; a similar survey is in progress in the town of Hopkinton in Merrimack County,

and a questionnaire has been sent to selectmen in 140 agricultural towns.

In Greenland and Stratham, 36 places were found with idle or very lightly used farm land of worth-while quality and amount. Altogether these 36 places had approximately 1,300 acres of tillage land and 850 acres of non-wooded pasture. Eight places had land enough to support a family-size commercial dairy farm, and 11 more had nearly enough, but because the buildings were occupied by the owner in nearly every case, both the larger and smaller places represent opportunities chiefly to farmers who have their farmsteads but need more land. In these small towns 13 active farmers indicated a need for land.

Apparently, on many small places and on a few larger ones, residential demand has outbid agricultural demand. However, the two uses are often not mutually exclusive because most of the owners of idle land were willing to have it farmed, and there appear to be mutually agreeable terms for leasing.

This preliminary study suggests the need for:

1. Pointing out to owners the advantages of renting or selling their farm land.

2. Making available to active farmers a list of land that might be rented or purchased.

3. Learning more about current renting practices and encouraging the better ones.

W. K. Burkett

*The Seasonal Milk Problem.* Deficiences in milk supplies on the Boston market from the New England milkshed during fall and winter months has necessitated imports to that market from outside areas. Before World War II supplies from New England sources were adequate to meet consumer demands for fluid milk during the entire year. While this did not mean that there was even production from all farms, the seasonality was less pronounced, November-December deliveries averaging approximately 65 per cent of May-June deliveries.

Increased milk consumption has necessitated an expansion of the Boston milkshed into former cheese and butter areas, and has created a squeeze on total available supplies, particularly during the fall and winter months. This increased demand has highlighted the producer problems related to high feed costs and labor shortages. At the same time the increased demand for beef expressed in high prices has caused the sale of dairy cows and replacement stock with a resulting depletion of milk-producing herds. Both the short- and the long-run effects are cause for concern by those responsible for meeting consumer demand. As milk prices are administered, it is essential that those responsible for prices should be fully informed of the competitive conditions in the supply areas in testing the adequacy of their price schemes in a dynamic market.

With these and other objectives in mind, the states supplying the major proportion of the Boston milk, namely, New Hampshire, Maine, and Vermont, are co-operating in a joint study to analyze the basic conditions of an uneven supply in these areas. A preliminary report of an interregional committee on dairy marketing research, set up in 1946 under the Research and Marketing Act, "Factors Affecting Seasonal Milk Production and Their Effect on Producers' Costs and Returns," surveys work already done in this field and outlines additional research needed.

In addition to the above joint study, each of the states concerned is analyzing the problem as it relates to local conditions. By such cooperation, much can be gained by pooling ideas and comparing results. This joint analysis of producer, dealer, and consumer problems is expected to contribute to the development of an economic framework for those concerned with the New England milk market. J. R. Bowring

*Chore Efficiency in Producing Pullets.* Detailed time records in doing the daily routine chores in producing pullets were taken at two-week intervals on 10 New Hampshire poultry farms. Four of the operators were using coal brooders and six had automatic heating equipment. In February, when the first records were taken, labor requirements were at a peak. The severe weather and early age of chicks required strict attention to brooding equipment. Water was supplied from numerous hand-filled small fountains and the feed was made available in a number of small feed hoppers.

As indicated in Table I, all the operators equipped with coal stoves, used over 30 minutes a day on routine chore work per 1,000 chicks, while four of the six operators with automatic heat used less than 30 minutes. Farm A, with the highest labor requirement, had the disadvantage of scattered pens and unhandy locations of supplies of feed and coal. The operator also fed three times each day.

The outstanding low labor record (Farm J) resulted from the simplification and combination of practices so that in one trip through the pens in the morning, sufficient feed and water were supplied in the containers to carry the chicks for 24 hours. After that it was only necessary to check on the condition of the chicks in the late afternoon. The operator performed each task efficiently and had the advantage of a modern two-story brooder house.

The change in time required in chore work as the brooding period progressed is illustrated in Table II. In mid-February the operator of Farm D had all coal stoves going full blast, which required careful attention and refuelling morning and night; the numerous small founts and feed hoppers in each pen also required considerable time in refilling. As the season advanced, the weather moderated and the birds were larger and hardier; less time was needed in tending fires until finally all fires were discontinued. Automatic waterers were substituted for the hand-filled founts which also increased the labor. The time required to feed, however, increased as

**Table I.—Total Man Minutes Per 1000 Chicks Routine Indoor Brooding Operations on 10 Farms**

| | |
|---|---|
| Farms Using Coal Brooders | |
| Farm A | 48.6 min. |
| Farm B | 46.8 min. |
| Farm C | 36.3 min. |
| Farm D | 32.2 min. |
| Farms Using Various Types of Automatic Heat | |
| Farm E | 37.6 min. |
| Farm F | 30.7 min. |
| Farm G | 27.0 min. |
| Farm H | 21.6 min. |
| Farm I | 20.5 min. |
| Farm J | 12.6 min. |

**Table II.—Total Man Minutes Per 1000 Chicks Routine Indoor Brooding Operations on Farm D**

| | |
|---|---|
| February 18 | 32.2 min. |
| March 3 | 27.8 min. |
| March 17 | 21.8 min. |
| March 31 | 14.3 min. |
| April 14 | 12.2 min. |

the birds grew older and consumed larger quantities.

H. C. Woodworth
and E. C. Perry

*Good Pasture and Hay-land Management Increases Farm Income.* The management problems in developing improved cropping and pasture programs and in farm reorganization were observed on 10 farms for a period of 10 years (1937 to 1946). The improvement practices adopted by each farmer were carefully planned to fit the needs of each individual case. The changes in practices were not made in any one year but were carried out as rapidly as time and funds were available to the individual operator.

On the 10 farms, 45 acres of rough pasture land were bulldozed, prepared, fertilized, and seeded for pasture. Areas of rough or less desirable tillage land were limed, fertilized, and diverted to permanent pasture. Areas of plowable permanent pasture were plowed, fertilized, and reseeded. In all, the amount of improved pasture was increased from 26 to 240 acres. In addition, 108 acres of tillage land, which had formerly been used for crop production only, were shifted to a crop-pasture rotation.

The application of fertilizers on the 10 farms increased from 32 tons, in 1937, to 104.5 tons, in 1946. Lime applications were increased from 46 tons to 249 tons in the same period. Cow numbers were adjusted to the increase in available roughage and pasture.

At the end of 10 years the farms carried 20 per cent more cows, produced 43 per cent more milk, and increased total yields of feed nutrients by 39 per cent.

Most of the improvements made in the 10-year period were associated with current production programs resulting in additional current income.

A comparison of the net incomes for the years 1937 and 1946, estimated on the basis of 1946 prices for both years, indicates that average net farm incomes had been increased by over $2,000. Improvements in roughage and pasture production and in farm organization were largely responsible for this increase in net income per farm.

M. F. Abell

# Crops and Pastures

*With What Grass Should Ladino Clover be Seeded for Pasture?* A number of pastures were seeded in 1942 and 1943 with mixtures of ladino clover and each of various tall grasses. Although the differences in yield were slight, the ladino clover-smooth brome grass mixture led all others. *(See chart, page 8.)*

Examination in 1947, five and six years after seeding, indicated that as much ladino clover remained in the smooth brome mixture as in any other combination and that there was

| Seeding Mixture | Ave. Annual Yield of Dry Matter per Acre |
|---|---|
| | Tons |
| Smooth brome-ladino | 3.03 |
| Orchard grass-ladino | 2.86 |
| Tall fescue-ladino | 2.81 |
| Timothy-ladino | 2.78 |
| Perennial rye-ladino | 2.78 |
| Reed Canary-ladino | 2.77 |

considerably more clover than in the reed canary grass or tall fescue associations. Counts also indicated that there were more volunteer grasses in the perennial rye plots than in any of the others.

These experiments conducted on various farms in the State are helping to increase the seeding of ladino clover for pastures, particularly when mixed with smooth brome grass. In semi-permanent pastures it is often desirable to include in the mixture a perennial clover, either red or alsike, to promote high production during the first two years of the stand.

F. S. Prince and
P. T. Blood

*How Should Fertilizer be Applied for Sweet Corn?* On an experiment conducted at Pittsfield, (N. H.), four different ways of applying fertilizer to sweet corn have been tried. The amount of fertilizer used was 1200 pounds per acre. The method of placing the fertilizer and the yield of sweet corn are shown below.

The results indicate that a divided application is preferable to applying it either all in the plow sole or all with the planter. For those who wish to control weeds with 2,4-D, the method of placing half of the fertilizer on the plow sole with the remainder applied with the planter offers an alternative to side dressing part of the fertilizer at the time of one of the early cultivations.

F. S. Prince, P. T. Blood,
R. Feuer, and L. T. Kardos

*What Varieties of Corn Should be Planted for Grain or Silage?* For the past several years trials of both silage and grain corn varieties have been conducted at Durham, and also on the McGoff farm in Lancaster and the Jones Brothers' farm at Claremont Junction. Under the auspices of the Agricultural Extension Service, silage corn variety trials were also conducted in Coos, Sullivan, Belknap, and Merrimack Counties.

As a result of studies of corn varieties during the past 13 years it has been found that under New Hampshire conditions the yields of silage and grain corn according to type are about as follows:

| Treatment | Average Yield Per Acre - 3 Years |
|---|---|
| | Tons |
| All applied on the plow sole | 5.181 |
| Half on the plow sole and half with planter | 5.271 |
| Half with the planter and half side-dressed at the time of the second cultivation | 5.306 |
| All with the planter | 4.991 |

| Type of Corn | Yield of Silage (Tons Per Acre) | Yields of Grain (Bu. Per Acre) |
|---|---|---|
| Flint | 8-10 | 35-40 |
| Dent-flint hybrid | 10-12 | 45-50 |
| Dent | 12-15 | 55-60 |
| Dent hybrid | 15-20 | 65-70 |
| Dent-sweet hybrid | 20-25 | ? |

Because the length of growing season varies considerably in New Hampshire, it seems advisable to make our recommendations in relation to this condition. The following chart shows the varieties of both grain corn and silage corn that are recommended for New Hampshire, depending upon the number of days available between the time of planting and the first killing frost in the fall.

**Grain Corn**

| Maturity Rating | Variety |
|---|---|
| Very early (less than 100 days) | Local Flints |
| Early (100-110 days) | Maine B and Wisconsin 240 |
| Medium (110-120 days) | Wisconsin 279, 335, 412 and Mass. 62 |
| Late (over 120 days) | Cornell 29-3 |

**Silage Corn**

| Maturity Rating | Variety |
|---|---|
| Very early (less than 100 days) | Mass. 62 |
| Early (100-110 days) | Cornell 29-3 |
| Medium (110-120 days) | Ohio M-15, Wisconsin 692 |
| Late (over 120 days) | Iowa 4059, Connecticut Dent-Sweet hybrids |

L. J. Higgins

*Oat Varieties.* Oat varieties have been tested since 1943. Disease-resistance is the most important factor to consider in selecting an oat variety for any part of the State. Results of the past few years indicate that the best varieties for our conditions are Ajax, and the new bond crosses such as Clinton, Benton, Zephyr, and Bond X Anthony. Other varieties may yield high in certain years but do not have sufficient disease-resistance to be relied upon.

L. J. Higgins

*Potatoes Yield Better When Magnesium is Added to the Fertilizer Mixture.* In our potato experiments at Colebrook we added a complete fertilizer and magnesium sulfate (supplying 40 pounds per acre of MgO) to one set of plots and complete fertilizer only (one ton of 5-10-10 per acre) to another set. When the yields were obtained it was found that on the average the addition of the magnesium sulfate increased the yield 69 bushels per acre. Individual plot yields were increased to as much as 110 bushels per acre. It would appear that the Coos County potato farmer can well afford to apply a fertilizer containing magnesium.

F. S. Prince, P. T. Blood, L. T. Kardos

*Potassium Sulfate Produces a Higher Quality Potato Than Potassium Chloride.* The average consumer of potatoes in New England prefers a "mealy" or high-starch potato. The New Hampshire Agricultural Experiment Station has been studying the source of potassium as a factor influencing the specific gravity of potatoes (Specific gravity and starch content are closely associated.) As a result of work conducted in the field at Northwood Ridge and Colebrook as well as greenhouse tests at Durham, no other conclusion can be drawn but that if the potassium in the fertilizer mixture is supplied in the form of potassium sulfate the potatoes are of superior quality as compared to those fertilized with a mixture in which the potassium is supplied as potassium chloride. It appears that the differences are sufficiently great so that some of the newer disease-resistant varieties of only fair cooking quality, by fertilization with potassium sulfate, may be improved sufficiently in quality to permit its adoption by the commercial grower without sacrificing quality.

F. S. Prince, P. T. Blood, L. T. Kardos

*Ontario and Essex are Proving to be Excellent Potato Varieties for New Hampshire.* Although some 23 varieties of potatoes are being tested, many of them either need further study or are definitely unsuited to our conditions. We are seeking a variety with the eating quality of a Green Mountain and which yields well and has disease-resistance. The Ontario approaches this ideal more closely than any other variety that has been tested at this Station. It is highly resistant to potato scab, has some resistance to late blight, yields well, and is of good quality, being definitely superior to such varieties as Katahdin, Sebago, and Chippewa in the last respect.

Another variety that should have an important place among the varieties is the Essex. This is one of the blight-resistant varieties developed at Cornell University. It is a consistent high yielder having ranked among the top three varieties ever since it was first introduced into our plots. It is a nice appearing, white-fleshed potato. Its only drawback is that it is low in specific gravity and hence does not have the good baking quality that is so much desired. On the other hand, the fact that it yields high, whether or not the season is cool or warm, wet, or dry, is a strong point in its favor.

P. T. Blood

*Sprout Inhibitor Lengthens the Marketing Period for Potatoes.* About 200 bushels of Kathadin potatoes were treated with a sprout inhibitor (a methylester of naphthaline-acetic acid) at the end of the rest period during the last week in March. The inhibitor was used according to the manufacturer's directions, one pound of 2.2 per cent dust to 11 bushels of potatoes. These potatoes remained in storage until the latter part of July and were still in a salable condition. None of the sprouts had developed to such an extent as to require their removal. The loss in weight during this period averaged only 3.17 per cent.

This method of dusting potatoes offers excellent possibilities to those who wish to market potatoes during the entire 12 months. The late fall crop can be left until the early potatoes are ready for harvest the next year. Those interested can contact their Agricultural County Agent in regard to where the sprout inhibitor may be purchased.

P. T. Blood and L. T. Kardos

*Many Weeds Can be Controlled by Using the New Chemical Herbicides.* Experiments were carried on in 1947-48 in an attempt to find effective ways of killing thistles. There are several kinds of troublesome thistles in New Hampshire. The Canada Thistle is a perennial which spreads extensively and becomes very serious once it is well established, while several other species commonly called Bull Thistles are biennials and die after flowering in their second year. All species are bad weeds, particularly in pastures. Much work has been done over the years in the United States and Canada on the control of Canada Thistle. Recently, there have been many conflicting recommendations as to suitable 2,4-D treatments for its control. The most recent work indicates that several applications of 2, 4-D are needed to kill the thistle completely. Our treatments were directed at the Canada Thistle but in most cases some Bull Thistles also were included. Several different chemical forms of 2, 4-D were used at the usual recommended concentration for general weed control of 1000 parts per million in water solution. Ammate and Granular Borax also were used, the ammate at the rate of 3 ounces per gallon of water, the borax at from 1 to 3 pounds per hundred square feet. The Canada Thistles were killed to the ground by the ammate, but after two or three weeks new shoots appeared from the surviving underground parts. Borax was not effective in thistle control. All the 2,4-D applications resulted in partial controls of Canada Thistle with no particular formulation outstanding. On the plots treated with 2, 4-D, only about one third as many stalks appeared the following year as were present at the time of treatment. Most of the Bull Thistle plants survived all treatments.

It is evident that 2,4-D will destroy Canada Thistles provided that several applications are made, starting early in the summer.

In recent years ,two yellow-flowered species of Devil's Paintbrush or Hawkweed have become very abundant in fields and pastures in New Hampshire. One, the Mouse-ear variety *Hieracium pilosella*, spreads extensively by runners over large areas to the detriment of most other vegetation. The other, called King-Devil *(H. florentinum)*, is a taller plant and occurs in scattered clumps. The King-Devil proved hard to kill with both 2,4-D chemicals and ammate, but on several plots the Mouse-ear Hawkweed was at least 90 per cent destroyed by single applications of the methyl and butyl esters of 2, 4-D when treatments were made at flowering time in late June. The 2, 4-D was used at a concentration of 1000 parts per million of water.

There has been a belief in New Hampshire that 2, 4-D is not dependable for Poison-Ivy control. Where areas have been treated with 2, 4-D, a considerable regrowth of the ivy has frequently occurred. It was decided first to compare 2, 4-D with better known Poison-Ivy killers. Plots were laid out on June 12 using (1) borax at 4 pounds per 100 square feet, (2) ammate at ¾ pound per gallon of water per hundred square feet, (3) the ammonium salt of 2, 4-D at 1000 parts per million of water, and (4) the methyl ester of 2, 4-D at the same concentration as the salt. The borax and ammate gave complete kills; the methyl ester was entirely effective only after a second application. The ammonium salt of 2, 4-D was considerably less satisfactory than the methyl ester, which agrees in general with reports from other workers.

On July 11, other plots were laid out to compare the effects of several available herbicides containing 2.4-D with each other and with ammate. Again ammate was more effective than the 2, 4-D formulations. The most effective of the 2, 4-D compounds was the butyl ester *(Weed-No-More)* which in one application destroyed nearly all the Poison Ivy on the area treated and was not greatly inferior to the ammate. For some reason, possibly the presence of heavy grass growth on this series of plots, some Poison Ivy persisted on every plot treated.

In view of the fact that most initial treatments of Poison Ivy with ammate and borax require follow-up applications of herbicide, it may well prove as effective in the long-run to use the 2, 4-D esters as the slightly more dependable ammate or borax.

An application of Weed-No-More, the butyl ester of 2, 4-D, at 1000 parts per million was made on July 10, 1947, to sweet corn overtopped by Wild Radish and Lambsquarters. On July 11 an application of 500 parts per million was tried. The conditions on both days were nearly ideal (full sunlight, temperatures of between 70° and 75° F. and moist soil). Both applications resulted in killing nearly all weeds. No obvious stunting or other injury to the corn was noted on subsequent visits during the summer.

Horseradish had overrun an area of valuable land on a farm in Dover. All previous attempts to destroy it had failed. The Horseradish plants were sprayed with 2, 4-D at a concentration of 1000 parts per million in late September 1947. It was noted in the spring of 1948 that most of the plants had been destroyed by the treatment.

Ammonium trichloroacetate, a product of the DuPont Company, was provided for experimental use in 1947. Complete kills of Quackgrass resulted when ammonium trichloroacetate was sprayed in water solution on infested areas at the rate of ½ pound of the chemical per gallon. The rate of application was at the rate of one gallon of solution per 100 square feet of area.

Some of the treated plots produced normal and vigorous crops of broad-leaved weeds in wide variety after periods of time varying from one to two months. Grasses, in general, were affected much more than other plants by ammonium trichloroacetate. Most of the residual effect of the chemical in the soil had disappeared within a month.

Sulfur Cinquefoil is a European weed of relatively recent introduction, but already it has become a dominant field-weed in parts of New Hampshire. The following treatments were made in an area of heavy infestation in Greenland in July 1947: ammate at 3 ounces per gallon of water; granular borax at 2 pounds per hundred square feet; the ammonium salt of 2, 4-D and the methyl ester of 2, 4-D each at the rate of 1000 parts per million of water. The 2, 4-D compounds destroyed the Cinquefoil in one application and caused very little injury to grasses.

A. R. Hodgdon

# Dairying

*Clover Hay is More Nutritious than Timothy for Dairy Cows.* In an experiment with four non-lactating cows, the digestibility, apparent absorption, and utilization of protein and energy were studied to

*Fig. 3—The ewe on the left received supplement cobalt costing approximately one-fourth cent per year; the ewe on the right received the same ration with the exception of cobalt. Note the difference in the size of the animals and the condition of the fleeces.*

compare the nutritive value of timothy hay cut at three different stages of maturity, and a second cutting of ladino-red clover hay. While all analytical work is not yet complete, the protein balances show that clover hay supplies twice as much protein as late-cut timothy hay.

*Fig. 4—The cobalt-deficient animal often chews wood.*

With regard to metabolizable energy, the early cut timothy hay surpassed the second cutting clover hay by over 5 per cent and the late cut timothy by 12 per cent.

These results show the tremendous importance that stage of maturity plays in the value of the roughage, especially in the Northeast where more emphasis should be placed on home-grown roughage in dairy cattle feeding.

N. F. Colovos, A. E. Teeri,
H. A. Keener, and J. R. Prescott

*Cobalt Studies with Livestock.* Early in 1944, workers at the New Hampshire Agricultural Experiment Station found that a nutritional deficiency which had been affecting cattle, sheep, and goats in parts of New Hampshire for well over 100 years could be prevented or cured by feeding very small amounts of cobalt. This deficiency was characterized by loss of appetite, loss of flesh, rough hair coat, anemia, weakness, decreased milk production, abortion, or even death. A marked improvement was usually observed within a week after the feeding of a very small amount of cobalt was started. The deficiency was found to be causing heavy loss over much of the State.

Because of results obtained by this and other agricultural experi-

ment stations, many feed manufacturers started to add cobalt to their rations in 1945. Because cobalt was becoming so widely used in concentrate rations and mineral mixtures, studies were carried out to determine the tolerance of growing dairy cattle to this element. It was found they could consume daily for periods of many weeks well over 100 times the amount normally consumed from the commercially mixed dairy ration containing added cobalt.

The next step was to develop the deficiency and study it under controlled conditions. This was done, using sheep as experimental subjects. A low-cobalt, locally-grown grass hay and corn purchased on the local market were fed. The animals were paired on the basis of weight, breed, and sex. One member of each pair was given 7 milligrams of supplemental cobalt twice a week. During a period of 26 weeks those animals which were given cobalt gained approximately two and one-half times as much as those which were given none. The deficiency symptoms were the same as for cattle, *i.e.*, loss of appetite followed by loss in weight, emaciation, loss of wool, etc. One very interesting observation made during this experiment was that internal parasites were very much more harmful to the deficient sheep than to those receiving cobalt.

In order to substantiate this experiment and to learn more about the function of cobalt in the diet of the ruminant, a second experiment was carried out — this has just been completed. It proved conclusively that cobalt deficiency could be developed in sheep when a low-cobalt ration was fed. All the 18 animals that were on the deficient ration for a considerable period of time showed very marked cobalt deficiency symptoms. All 10 animals which were given 3½ mg. of cobalt twice a week remained in perfect health. Despite the fact that evidence indicates that cobalt is necessary for the production of some appetite-stimulating vitamin or other factor by the flora of the rumen, all attempts to alleviate the deficiency symptoms by means of synthetic vitamins, amino acids, liver extract, other minerals, etc. have been unsuccessful.

At the present time cobalt deficiency is very rare in New Hampshire because of the widespread feeding of cobalt-containing rations, cobalt-containing mineral mixtures, and the direct use of cobalt salts. That the cost is low is proved by the fact that many farmers are protecting the entire herd for well under one dollar per year.

H. A. Keener, G. P. Percival, K. S. Morrow, and J. R. Prescott

*The Infusion of 400,000 Units of Penicillin is Very Effective in the Cure of Streptococcal Mastitis.* During the past year particular attention has been devoted to the treatment of streptococcal mastitis with penicillin and penicillin and sulfamethazine combined. It was found that if 400,000 units of penicillin were allowed to remain in each quarter for a 24-hour period without milking, excellent results occurred — much better than when only 12 hours were allowed without milking. Of all the cases tested, 89 per cent were cured by this treatment. Combining 100 ml. of 10 per cent sodium sulfamethazine with 200,000 or with 400,000 units of penicillin did not prove advantageous as compared with penicillin alone.

L. W. Slanetz and F. E. Allen

# Entomology

*Houseflies Build Up a Resistance to DDT and to Certain Other Insecticides.* The toxicity to houseflies of various contact insecticides has been studied for the past several years. In comparing the effect of various materials this year with the results obtained during each of the past three years it was immediately evident that the flies were developing a resistance to the insecticides. With respect to DDT, lethane, and the pyrethins the resistance was twice as great this year as it was three years ago. In the case of benzene hexachloride, the resistance of the houseflies increased approximately seven times. It is assumed that this increased resistance is caused by the continued elimination of the weaker individuals over a period involving many generations.

J. G. Conklin, W. C. O'Kane, R. L. Blickle, and W. J. Morse

***Fig. 5—Doctors Slanetz and Allen examine mastitis cultures.***

*New Pesticides are Effective in Controlling the European Red Mite.* Hexaethyl tetraphosphate, DN 111, DND 4, and Xanthone were tested for the control of the red mite on apple trees. The initial reductions in mite population as compared with the untested trees were as follows: Haxaethyl tetraphosphate — 99.3 per cent; DN 111, 97.4 per cent; DND 4, 96.7 per cent. and Xanthone, 90.5 per cent. Although hexaethyl tetraphosphate gave the highest initial control the mite population later built up on the plots so that they exceeded those on the check plots. The reason for this is that this chemical does not kill the eggs and it also affects the natural parasites of the red mite. If one application only is to be made, hexaethyl tetraphosphate is not recommended.

J. G. Conklin, W. C. O'Kane, R. L. Blickle, and W. J. Morse

*Four Applications of DDT Dust are Needed to Control the European Corn Borer.* The marketability of sweet corn in New Hampshire is seriously affected by European Corn Borer damage. Effective and cheap methods of control are highly necessary for the successful production of sweet corn. The New Hampshire Agricultural Experiment Station is studying the effectiveness of different methods of control. Although research is continuing on this problem we now recommend four applications of a 3 per cent DDT dust. Fair control can be obtained with three applications, but two applications are entirely unsatisfactory.

J. G. Conklin, W. C. O'Kane, R. L. Blickle and W. J. Morse

*Parathione is Effective in the Control of the Eye-Spotted Bud Moth.* Parathione was used on apple trees to control the eye-spotted bud moth. The material was employed at the rate of two pounds of 15 per cent wettable powder to 100 gallons of water. It was applied in the dormant, delayed dormant, and pink sprays. The degree of contact was excellent, and definitely superior to either nicotine or DN. Parathione seemed to have an advantage in that it can cause high mortality even after the bud moth larvae have penetrated rather deeply into the swelling or opening buds.

J. G. Conklin, W. C. O'Kane, R. L. Blickle and W. J. Morse

# Forestry

*The Amount of Wood Waste is High in the Manufacture of Heels and Cooperage Products.* The Department of Forestry at the University of New Hampshire and the Engineering Experiment Station have been studying the supply of low-grade wood available for manufacturing plastics. During the past year two wood-using industries were studied — manufacturers of wooden heels and white pine cooperage products. The data showed that 32 per cent of the lumber purchased for the manufacture of shoe heels became waste during the first two operations *i.e.*, cross cutting and ripping. In cutting up white pine logs for cooperage products, it was found that 22 per cent of the log was unusable for further manufacture. During 10 other processes, the loss incurred in individual operations ran as high as 33 per cent on the basis of weight before and after the manufacture of the pieces. It appeared that the waste could be reduced considerably by the use of higher quality raw material.

L. C. Swain

*The Brown Color of Maple Syrup is Caused by the Heating That Occurs During Evaporation.* The Forestry Department in co-operation with the Engineering Experiment Station has been collecting sap from various selected maple trees near Durham to study various characteristics of sap flow. Some of the sap collected was evaporated in a vacuum at a temperature of 120°F. By evaporating the sap at such a low temperature a nearly colorless syrup resulted. According to Dr. J. Seiberlich, research assistant professor at the Engineering Experiment Station, who actually made the syrup, the maple flavor was even more intense than in syrup made in the usual manner. Plans are underway to conduct additional studies this coming year.

C. L. Stevens

*The Effect on the Maple Tree of the Kind of Spout Used and the Treatment of the Tap Hole.* An investigation has been made to determine the effect on the tree of the type of spout used and the treatment given the tap hole after the spout has been removed. Two small sugar maples were tapped, each one in 20 places, and spouts of metal, wood, and rubber were used. Some of the holes were left without spouts. The trees were cut in the fall and split for detailed study. The holes in which metal spouts were used showed the greatest amount of stain in the wood; the least staining occurred around the holes without spouts. Wood and rubber were both intermediate in their effect upon staining.

After the spouts were removed the holes were washed with ethyl alcohol,

glycerine, or formalin. Some of the holes were plugged with wood, and the others were left open. The holes which were treated with alcohol showed less staining than the others. Plugged holes showed more staining than unplugged holes. The staining is apparently caused by a fungus. Numerous cultures of wood were made but the organism was not conclusively identified.

C. L. Stevens

# Fruits

*An Outstanding New Strawberry Variety is Named Great Bay.* For a number of years a strawberry seedling resulting from a cross between Simcoe and Catskill has been outstanding in certain qualities. It had been designated as number 62. Again, in 1947, it was the outstanding variety among 109 selections from 1,350 seedlings of crosses made in 1946. It has now been released to the trade under the name of Great Bay.

The plants are vigorous, and drought-resistant, and produce large crowns and root systems. Individual plants may produce 10 or more trusses of fruit held well above the ground. Runner production is moderate so that plants become well spaced in the row.

Great Bay berries are medium to large in size, and of medium flavor, being less tart than Howard 17. In season they are three to four days later than Howard 17, and produce berries of good size to the end of the fruiting period.

Great Bay is recommended for the home garden and the local market.

L. P. Latimer

*Hay Mulch Reduces Magnesium Leaf Scorch on Apple Trees.* A leaf scorch of apple tree leaves caused by magnesium deficiency is prevalent in numerous orchards in New Hampshire. Because it also exists in the University orchard, methods of control have been conveniently studied. Six years ago a block of trees which showed considerable leaf scorch were tested in various ways. Although it has been shown that the scorch can be prevented by spraying the leaves with a solution containing magnesium, the most practical method resulting from these studies appears to be that of applying a hay mulch. When the experiment started, the trees that were designated to receive a hay mulch had about 20 per cent of their leaves affected with leaf scorch and the trees in the unmulched sod plots had about the same amount of scorch. During the past season, the trees in the sod plots had 23 per cent of their leaves affected by leaf scorch while only 2.5 per cent of the leaves on the hay-mulched trees were scorched. It should be stressed, however, that the effect of the hay mulch is not immediate; it may require four to six years to reduce the severity of the leaf scorch.

Greenhouse studies have indicated that organic salts of magnesium, such as magnesium acetate and magnesium ammonium phosphate, are better sources of magnesium than is magnesium sulfate. This conclusion is based on the better growth that resulted from the organic salts when supplied to apple trees grown in sand and water cultures. More detailed studies are necessary to determine the causal factors involved.

Non-scorched leaves of McIntosh apple trees had a higher magnesium content throughout the season than did apparently normal leaves from trees known to be susceptible to leaf

*Fig. 6—The Durham raspberry produces firm fruit that ships well.*

scorch. Scorched leaves were markedly lower in magnesium content than non-scorched leaves on the same tree or branch.

L. P. Latimer, G. P. Percival, and S. Dunn

*New Fruit Varieties are Being Tested.* Several new apple varieties fruited normally for the first time in 1947. One of the most attractive was Joan, which also produced a well-spaced crop on the trees. The quality of the fruit, however, was not of the best, being rather acid and somewhat lacking in distinctive flavor. Another apple variety that attracted some attenttion was *Idared*; this was the largest apple on the farm. On vigorous wood, however, it lacked color and was too acid. The *Medina* variety continued to show promise. It resembles *Delicious* and actually has been larger in our plots. The cooking and eating qualities are good. It does not carry as fine a finish as *Delicious*. *Sharon* is another new apple variety which deserves watching. It bears a crop of medium-sized fruit. Among the early varieties, one of the most promising is *Mantet*, a variety introduced from Canada. None of these new apple varieties have proved to be equal to McIntosh or Cortland as commercial varieties.

At the University Horticultural Farm, the *Red Haven* and *Hale Haven* peaches have yielded well and have proved to be hardy. The *Red Haven* is recommended as an early variety and the *Hale Haven* for the main crop.

Winter hardiness is a highly important consideration in selecting grape varieties. Of those that survived the winter of 1947-48 without injury are *Fredonia*, *Van Buren*, *Kendaia* and *Erie*.

A. F. Yeager

*The Durham Raspberry is Gaining in Popularity.* The Durham raspberry, a new everbearing variety developed by the New Hampshire Agricultural Experiment Station a few years ago is becoming widely distributed. Because it bears a crop in late summer on the old wood and a second crop on the new canes in September and October, it is proving to be a desirable variety. Although the fruit is not of the highest quality, it is most acceptable at a time of year when raspberries are unavailable. The berry is firm and attractive. *(See Fig. 6.)*

A. F. Yeager

*Fig. 7—The 13 quarts of low-bush blueberries on the left were obtained from a 10 x 50 foot plot when fertilized the previous year with 1000 pounds per acre of a 7-7-7 fertilizer. The check plot (unfertilized) yielded only 6 quarts from the same sized plot.*

*A Low-Growing, High-Yielding Blueberry is Being Developed.* Because of the danger of winter killing high-bush blueberry plants when their tops protrude above the snow, attempts are being made to develop a half-high plant by crossing a cultivated high-bush blueberry with selections from the native low-bush plants. So far, crosses between the cultivated variety, Pemberton, and native low-bush berries have produced some very promising, half-high plants that greatly outyield any native half-high plants that have been brought under cultivation.

W. W. Smith

*A New Method of Pruning Apple Trees is Being Tried.* The usual method of pruning apple trees consists of thinning out the dense groups of small branches on the outside of the tree to admit light; water sprouts and crossed limbs and the weak wood are removed in the process. Another system, developed by the Michigan Agricultural Experiment Station for which remarkable results have been claimed, consists fundamentally in removing all of the thin wood inside the tree with little pruning of the outer branches. Both systems have been tried at the University Horticultural Farm for four years. No significant differences were obtained in yield, fruit size, or color. Because such widely differing systems produced no important differences, a new method is being tried which is called "Pruning for Convenience".

It has as its objectives more convenient pruning, spraying, and picking.

A. F. Yeager

*Hay Mulch Proves to be Superior to Sawdust or Seaweed for Apple Trees.* Trees of similar diameter yielded more fruit with hay mulch than they did when mulched with sawdust or when unmulched. Seaweed resulted in poor fruit color. All the mulch treatments increased fruit size in a similar manner. The nitrogen relationships in connection with the use of sawdust need further study.

L. P. Latimer, G. P. Percival, and S. Dunn

# Plant Pathology

*Leaf-Roll Symptoms May not Appear on Foliage of Potatoes Grown in the Greenhouse.* The leaf-roll virus affects the food-conducting element in the potato stem and tuber so that food materials manufactured in the leaves cannot be translocated from the leaves to the tubers. Starch, therefore, accumulates in the leaves and causes the rolling of the leaves which is the typical symptom of leaf-roll in potatoes.

Under greenhouse conditions of low light intensities and moderate levels of nitrogen in the soil, starch accumulation does not occur and the leaf-roll symptom is not evident even though the plant has been inoculated with the virus.

In order to have the visual symptoms appear under greenhouse conditions, the nitrogen level of the soil should be rather low and adequate water should be supplied. The addition of small amounts of phosphatic fertilizer also intensifies the leaf-rolling symptoms.

M. C. Richards

*New Fungicides Prove Effective in Controlling Apple Scab.* Of about eight new fungicides that were tested last year, Phygon, Puratized, and Magnetic sulfur gave the best control of apple scab. Phygon, ¾-100, produced some foliage injury but gave the best control of scab on both fruit and foliage. All materials tested gave reasonably good control which goes to prove that proper timing, adequate dosage, and good coverage are highly important.

M. C. Richards

# Poultry Husbandry

*A Better Meat Type Bird is Being Developed From a Dark Cornish-New Hampshire Cross.* The Dark Cornish-New Hampshire cross that was made here eight years ago has produced some excellent progeny The carcasses of these meat cross chickens are very plump and broad breasted. *(See Fig. 8.)* The live birds greatly resemble the "New Hampshire", except that they are close feathered, have a very broad breast *(See Fig. 9)*, deep, long body, and a long keel *(See Fig. 10)*.

During the past year, 61 of these meat-cross females were used in four special mating pens. A total of six males were used, each hen being mated to two different males during the hatching season. Over a hatching period of eight weeks, 1795 eggs were set from these hens. A fertility of 90.1 per cent and a hatchability of 76.75 per cent of all fertile

*Fig. 8—Dressed carcass of a Meat Cross female and male respectively.*

eggs was obtained. Approximately 20 per cent of the hens had a hatchability of 90-100 per cent and about 50 per cent showed a hatchability of 80-100 per cent.

Egg production has varied considerably, and many birds were culled early in the trapnest period because of unsatisfactory characters in egg quality, size, body conformation, or crooked toes. However, 13 birds laid 200 or more eggs during the year, the highest number being 237 eggs. There was very little broodiness present.

The body weights at eight weeks were approximately the same as those of average New Hampshire chicks, but the mature body weights were somewhat less. Although considerable progress has been made in developing these birds, much work remains to be done, especially in producing greater uniformity in color, and in eliminating disqualifications.

C. W. Hess

*Poultry Individuals Vary Tremendously in Their Consumption and Utilization of Feed.* Because the cost of feed represents from 50 to 60 per cent of the operating expense of a poultry business, studies of ways and means of reducing feed costs without loss in production of meat and eggs would appear to be highly important.

One phase of this problem is to determine the inheritance of feed utilization efficiency. A start has been made on this problem using laying hens and mature males. Some New Hampshire birds were confined in individual cages, and bi-weekly body weights and individual feed consumption data were recorded. Eggs were collected and weighed daily. From these males and females 10 groups of chicks were hatched, each group having a common size; then feed consumption and body weight were recorded for all individuals of each group, which later on will be used as breeders to obtain more information on the inheritance of feed utilization efficiency.

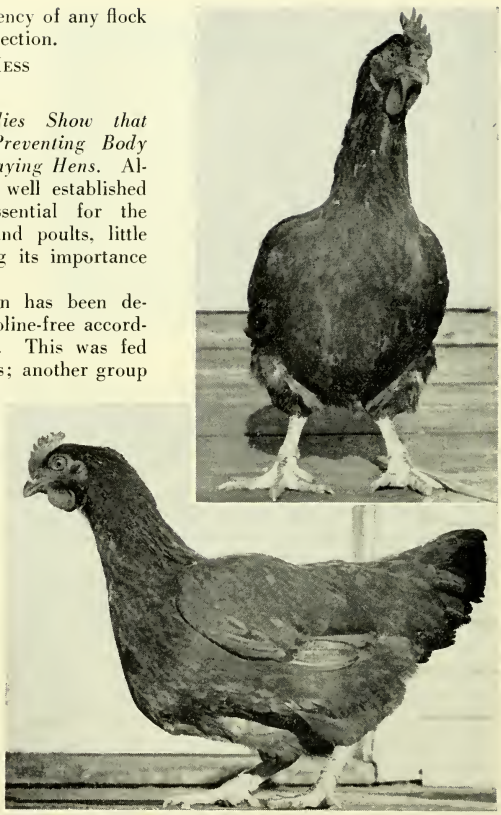
The most interesting result of this new study is that individual males and females vary greatly in their apparent efficiency of feed utilization. For example, hen No. 27 consumed 34.16 per cent more feed than did hen No. 6, while hen No. 6 made a greater gain and produced a slightly greater weight of eggs. If it can be proved that the qualities present in hen No. 6 are inherited it would reveal the possibility of increasing the

feed utilization efficiency of any flock by breeding and selection.

C. W. Hess

*Preliminary Studies Show that Choline Aids in Preventing Body Weight Losses in Laying Hens.* Although it has been well established that choline is essential for the growth of chicks and poults, little is known concerning its importance for laying hens.

A synthetic ration has been developed which is choline-free according to our analysis. This was fed to one group of hens; another group received this basal ration with choline added, and the third group received a control ration consisting of a commercial all-mash laying ration.



***Figs. 9 and 10—A front view of a Meat Cross hen showing the extremely broad breast is pictured in Fig. 9 (above). Fig. 10 (below) shows a side view of a Meat Cross pullet. Note the deep, long body and the length of the keel ahead of the legs.***

The experiment ran for 112 days. During this period the hens on the control ration maintained their body weights. The hens receiving the basal ration without choline lost considerable weight and declined in egg production. The basal ration with choline added slowed the decline in body weight and egg production.

This study is being continued and emphasis next year will be placed on the possibilities of replacing the amino acid methionine with the less expensive choline.

R. C. Ringrose

*New High-Energy Feed Proves Highly Profitable in Raising Broilers.* A 12-week broiler growth experiment was conducted using four different broiler feeds. Two feeds were commercial mixed feeds purchased on

the local market. A third was the New England College Conference formula as recommended during the year 1946 for chicks and broilers. These three feeds were of the usual type in common usage during past years. The fourth feed was a new type, high energy, low fiber feed developed by the Connecticut Station particularly for broiler feeding. It is charactetrized by its content of approximately 70 per cent cornmeal and its low fiber content, roughly 3 per cent or under. At the present writing, such a feed is more costly to produce; but with adequate supplies of feedstuffs this situation will be somewhat changed.

The chicks used were obtained from five crosses of White Plymouth Rocks, Barred Plymouth Rocks, and different strains of New Hampshires maintained at the University of New Hampshire poultry farm. Thus, each pen contained five different types of chickens, each type in approximately equal numbers.

The most significant figure from the experiment is the income over feed cost per thousand broilers raised. For commercial feed A this amounted to $363; for commercial feed B, $387; for the New England College Conference, $579, and for the Connecticut Broiler ration, $611.

A mimeographed sheet giving the complete details of the experiment is available for distribution.

R. C. Ringrose

***Fig. 11—In our nutritional studies with poultry, the birds must be weighed frequently to determine any losses or gains in body weight.***

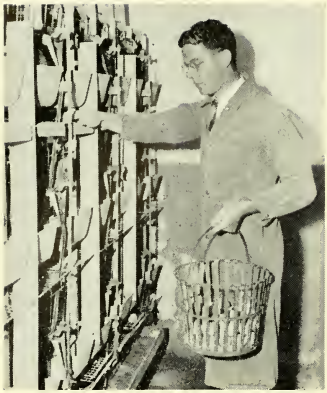


*Fig. 12—Each hen is confined in a pen so that she can be fed separately. A complete record of weight and egg production is kept for each bird.*

# Soils

*Experiments at Northwood Demonstrate the Value of Topsoil.* That the prevention of soil erosion is important has been demonstrated in a striking manner on our Northwood Soil Erosion Experimental Field. The topsoil was removed from an area in the spring of 1945. A portion of the area was left unfertilized but seeded to a grass legume mixture. Another portion was fertilized in 1945 prior to seeding oats, and fertilized again in 1946 prior to seeding the grass legume mixture. All treatments were compared to unfertilized plots that had none of the topsoil removed.

The results were that when all the topsoil was removed and no fertilizer added, timothy and brome grass failed completely and only a very weak stand of clover persisted. The plots that had the topsoil removed but which were fertilized and cropped for three years had a much better growth of grasses and legumes, but did not equal the completely unfertilized plots that had none of the topsoil removed.

It is well-known that very unsatisfactory yields of grass and clover hay are obtained on unfertilized land — yet applying liberal quantities of fertilizer to land lacking topsoil for three years has not made it possible to equal the yield obtained on unfertilized normal soil.

L. T. Kardos

*The Soil Survey Continues in Rockingham County.* The soil survey of the State was continued this past year with mapping in Rockingham County. Systematic investigations of the soils, slope, erosion, and present land use were made and the extent and nature of these factors were delineated on aerial photographs, scale 1″ equals 1320′. Mapping completed was mainly in the towns of Nottingham and Northwood. The Paxton soils (well drained, Brown Podzolic, deep, developed on compact, platy, olive-colored glacial till derived from acid mica schist rock) are found in much of this area. These soils are well suited to dairy farm crops. Where

gentle slopes occur, they are well suited to potato production. Paxton soils are characteristically found on drumloid hills which often afford good air drainage for orchard sites.

The Soil Conservation Service has furnished the use of aerial photographs and a stereoscope. Because of the lack of qualified personnel they have been unable to furnish a mapper this past year but a new man will be available next year. The Bureau of Plant Industry, Soils and Agricultural Engineering, has furnished one man, Mr. H. Hudson Bailey, a truck, and mapping equipment. Approximately 38.5 square miles were mapped during the 1947 mapping season. Sixty-nine per cent of the county (473 out of 691 square miles) has been completed.

The soil survey information is being used by many people within and outside the State. Some uses to date have been:

(1) location of experimental plot areas

(2) correlation of soils and certain native plants, *e.g.*, blueberries

(3) location of orchard sites

(4) interpretation of glacial geology of the State

(5) planning soil conservation programs on individual farms

(6) training new soil scientists and students enrolled in soils and crops courses at the University.

Publication of the Sullivan-Cheshire Soil Survey Report is expected sometime in 1949.

R. Feuer

# State Service

*Inspection of Fertilizers and Feedingstuffs.* In accordance with the public statutes regulating the sale of commercial fertilizers and of concentrated commercial feedingstuffs, 70 brands of fertilizers and 604 brands of feedingstuffs were analyzed during the year 1947-48. These analyses involved individual determinations totaling 604 and 3030 respectively. Co-operation in work on analytical methods with the American Association of Feed Control Officials and with the Smalley Foundation has been continued.

T. O. Smith

*Seed Inspection.* The regular seed inspection work for the State Department of Agriculture was conducted as usual. During the year, 2,933 samples were handled in the laboratory. Of this number, 488 were collected by the State Inspectors and will be reported in Bulletin 374; 2,535 samples were sent in by seed dealers in compliance with the clause in our seed law which requires that all vegetable and agricultural seed must have been tested for germination within nine months of being offered for sale. Therefore, much of this testing was seed carried over from the previous season; a few of these samples were sent in by farmers who had grown beans or corn and wished to sell it for seed.

Referee work was carried on as usual.

B. G. Sanborn

*Pullorum Testing.* During the past fiscal year the Poultry Laboratory at the University of New Hampshire set up agglutination tests for pullorum disease on the blood of 1,360,465 hens; 90,620 retests were made on flocks, making a total of

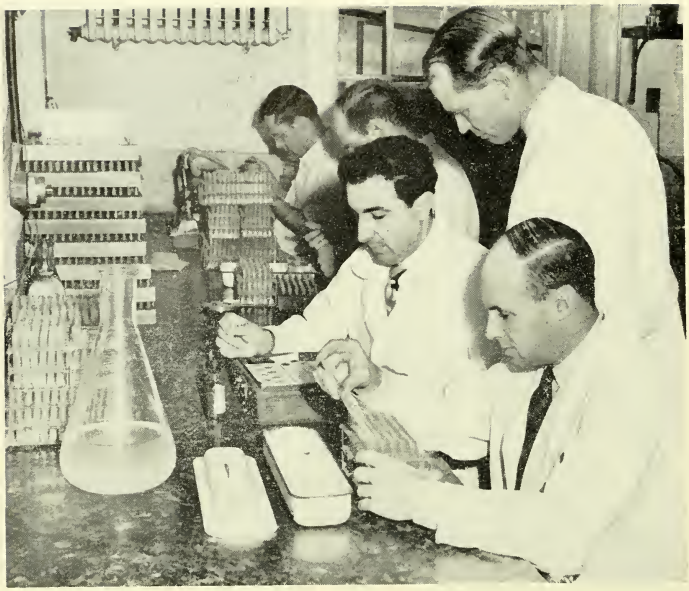


*Fig. 13—Our veterinarians and laboratory technicians test blood samples from over a million birds each year to determine the presence or absence of pullorum disease.*

1,451,085 samples that were tested during the year.

Infection was found in 16 flocks of the 692 that were tested. This represents only 2.3 per cent infection and New Hampshire thus becomes one of the cleanest states in the country as far as pullorum disease of poultry is concerned.

F. E. Allen, D. V. M.
A. C. Corbett, D. V. M.
G. P. Faddoul, D. V. M.

*Infectious Bronchitis Virus.* During the past fiscal year, 102 poultrymen procured Infectious Bronchitis virus from the Poultry Laboratory. Poultrymen use this virus to produce the disease in their young stock; after recovery the birds have a lifetime immunity. Thus, the poultryman is spared the ravaging effects which this disease produces in adult stock, mostly through weeks of lost egg production.

This virus cannot be shipped interstate but is available to any poultryman in the State. It is obtained from the trachea of artifically infected hens and is held in the frozen state until used. It is available at all times of the year.

F. E. Allen, D. V. M.
A. C. Corbett, D. V. M.
G. P. Faddoul, D. V. M.

*Autopsies at the Poultry Laboratory.* During the fiscal year 1947-48, a total of 2,589 specimens of all kinds were submitted to the Poultry

Laboratory. These represented 1,072 cases.

A total of 2,393 birds were examined. There were 933 cases of birds other than turkeys; the remainder of the specimens consisted of 154 turkeys (68 cases) and 196 Miscellaneous (71 cases).

In addition to those mentioned, 98 Hemagglutination Inhibition tests for Newcastle disease were run on pooled flock sera obtained from the pullorum samples. Three of these proved to be positive for Newcastle disease. The Newcastle work was not staarted until April 1948.

A. C. Corbett, D. V. M.
G. P. Faddoul, D. V. M.
F. C. Allen, D.V.M.

*The National Poultry Improvement Plan.* The National Poultry Improvement Plan became operative July 1, 1935 under the sponsorship of the Federal Government with the co-operation of the states on a voluntary basis. Acceptance of the plan is optional with the individual. That the plan has met with general acceptance is now evidenced by the fact that it is in operation in 47 states. The chief objectives of the plan are to improve the breeding and production qualities of poultry, to reduce losses from pullorum disease, and to identify the quality of breeding stock, hatching eggs, and baby chicks with uniform terminology applicable throughout the country. In New Hampshire, the plan is administered by a board of 10 active poultrymen with the co-operation of the University of New Hampshire, the Agricultural Experiment Station, and the State Department of Agriculture.

During the past year, 290 poultrymen owning 813.766 birds participated in the various breeding stages of the plan in New Hampshire. In addition, 357 poultrymen, owning 573.029 birds,, participated in the pullorum eradication stages but not in the breeding stages of the plan. Fourteeen poultrymen have flocks participating in the Record of Performance breeding stage of the plan. These flocks contain 6392 R.O.P. candidates under trapnest and 148 special mating pens containing 2061 R.O.P. females.

T. B. Charles, Contact Agent
E. T. Bardwell, NPIP and ROP Supervisor
Conrad F. Zoerob, Poultry Inspector

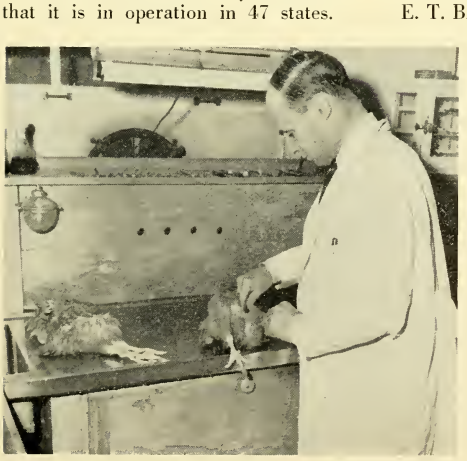


***Fig. 14—Hundreds of diseased birds are examined each year in our poultry autopsy laboratory.***

*Mastitis Testing Service.* A total of 2,036 quarter samples of milk submitted by New Hampshire dairymen or veterinarians were tested for the diagnosis of bovine mastitis. This represents samples from 509 cows. Charges were made at the rate of 25 cents per cow for this service.

For the year ending June 30, 1948, 432 samples of milk and cream were tested for butterfat, 47 samples for bacteria, and 22 samples of dairy products for total solids.

During the year, 972 milk test bottles and 168 pipettes were calibrated.

Other services covered under Dairy Bacteriology Testing include the supply of the Babcock glassware to the D.H.I.A. testers.

L. W. Slanetz
H. C. Moore

## Other Active Projects

The Agricultural Experiment Station had, during the year, 60 active research projects. With a small staff it is impossible to obtain sufficient results each year to justify making an individual report on each one. Furthermore, some of the projects are of such a nature as to require several years before any tangible results are accumulated. All projects will be reviewed in the annual report from time to time. Those that have not been discussed in this report are listed below by title only, in order that everyone may gain an appreciation of the full scope of the work of the New Hampshire Agricultural Experiment Station.

*A Statewide Survey of the Nutritive Value of Home-Canned Fruits and Vegetables.* H. J. Purinton, S. R. Shimer

*A Study of Thiamine Assay Methods.* A. E. Teeri

*The Carbohydrates of Pasture Grasses.* T. G. Phillips and T. O. Smith

*Chemical Studies on Methods for Determining Certain of the Vitamins as they Occur in Foods.* H. J. Purinton and S. R. Shimer

*The Utilization of Good Agricultural Resources.* W. K. Burkett

*Factors Relating to the Marketability and Returns from Small Fruits.* L. A. Dougherty and J. C. Holmes

*Maintaining Quality and Premiums in Marketing Certain Fruits and Vegetables.* L. A. Dougherty

*The Determination of Small Grains Adapted to Better Land Use in Northern New Hampshire.* P. T. Blood

*The Feasibility of Drying Young Grass for Use as a Grain Substitute.* F. S. Prince, P. T. Blood, and G. M. Foulkrod

*Pasture Renovation for Efficient Land Use and Soil and Water Conservation.* L. T. Kardos and P. T. Blood

*Seed Production Possibilities of Forage Crops.* P. T. Blood and L. J. Higgins

*The Improvement of Ladino Clover, Red Clover, and Timothy by Selection and Breeding.* F. S. Prince, P. T. Blood, and L. J. Higgins

*Studies on Synergists for Insecticides.* J. G. Conklin, R. L. Blickle, and W. J. Morse

*The Control of Apple Maggot and Certain Other Economic Insects.* J. G. Conklin

*Studies of Insects Affecting Spruce.* J. G. Conklin

*Annual Insect Record.* J. G. Conklin, R. L. Blickle, and W. J. Morse

*Marketing of White Pine Thinnings.* L. C. Swain

*Propagating High Sugar-Producing Types of Sugar Maples.* C. L. Stevens and S. Dunn

*Nut Improvement.* A. F. Yeager

*Cultural Studies of Fruit.* L. P. Latimer

*The Use of Malling and Other Root Stocks as a Means of Obtaining Semi-Standard Apple Trees.* W. W. Smith and A. F. Yeager

*The Establishment and Development of Low-Bush Blueberry Fields.* W. W. Smith and A. R. Hodgdon

*Ecological Factors Associated with Low-Bush Blueberry Production.* W. W. Smith

*Winter Injury in Deciduous Fruits.* A. F. Yeager, C. L. Calahan, and P. H. Beij

*The Lilac and its Culture.* C. L. Calahan

*Flower Variety Trials.* C. L. Calahan

*Trials of Ornamental Shrubs.* C. L. Calahan

*Control of Tomato Diseases.* M. C. Richards

*A Study of the Cause and Prevention of Gizzard Lesions in Chickens.* R. C. Ringrose and H. A. Davis

*The Influence of Soil Texture, Soil Moisture, and Soil Aeration on the Growth of Plants.* S. Dunn

*Vegetable Variety Trials.* A. F. Yeager

*Bean Breeding.* A. F. Yeager

*Vegetable Cultural Studies.* A. F. Yeager

*The Breeding of Watermelons for New Hampshire.* A. F. Yeager

*The Development of Better Spraying and Dusting Equipment for Pest Control of Fruits and Vegetables.* E. J. Rasmussen and G. M. Foulkrod

*Factors Affecting the Storage of Squash.* A. F. Yeager, P. H. Beij, T. G. Phillips, and M. Loughlin

*Breeding Improved Early Tomatoes.* A. F. Yeager, C. L. Calahan, P. H. Beij, H. Purinton, and M. Loughlin

*Muskmelon Breeding.* A. F. Yeager and C. L. Calahan

## Expenditures for the Fiscal Year Ending June 30, 1948

| | Hatch | Adams | Purnell | B-J*nes | Research and Marketing 9(b)1-9(b)2 | 9(b)3 | Supplementing |
|---|---|---|---|---|---|---|---|
| Personal Services | $11,965.65 | $14,106.46 | $54,965.44 | $8,536.31 | $2,544.74 | $2,566.66 | $37,187.67 |
| Travel | 375.44 | 137.17 | 1,675.04 | 170.64 | 537.79 | 593.05 | 1,548.05 |
| Transportation of Things | 22.94 | 26.95 | 87.38 | | 9.32 | 8.12 | 104.24 |
| Communication Service | 468.13 | 7.16 | 31.89 | 12.95 | 4.58 | 9.47 | 187.07 |
| Rents and Utility Services | 1.000.00 | 5.00 | 130.52 | 63.00 | | | |
| Printing and Binding | 520.54 | | 452.25 | 72.90 | | 6.55 | 130.00 |
| Other Contractual Services | 103.09 | 34.30 | 477.63 | 190.55 | 150.00 | | 214.44 |
| Supplies and Materials | 402.12 | 401.86 | 1,232.96 | 137.36 | 10.44 | 11.22 | 5.855.59 |
| Equipment | 142.09 | 281.10 | 946.89 | 32.64 | 2,407.06 | | 5,043.43 |
| Lands and Structures (Contractual) | | | | | | | |
| | $15,000.00 | $15,000.00 | $60,000.00 | $9.216.35 | $5,663.93 | $3,195.07 | $50,270.49 |

Income for Supplemental Expenditures:

| | |
|---|---|
| State Money Offsetting Federal Funds | $22,757.34 |
| State Money for Station | 206.26 |
| Research Sales | 27,296.89 |
| | $50,270.49 |

## PUBLICATIONS

### Bulletins

Smith, T. O., and Davis, H. A. *Inspection of Commercial Feedingstuffs. No. 369*

Sanborn, Bessie G. *Results of Seed Tests for 1947. No. 370*

Smith, T. O., and Davis, H. A. *Inspection of Commercial Fertilizers. No. 371*

Eastman, M. G. *Agricultural Research in New Hampshire. No. 272*

### Circulars

Abell, Max F., *Economic Analysis of Fourteen Years of Poultry Records. No. 75*

Woodworth, H. C., Morrow, K. S., and Holmes, J. C. *Efficient Dairy Chore Practices, Part II - Rapid Milking. No. 76*

### Technical Bulletins

Shimer, S. R., and Purinton, H. A. *The Ascorbic Acid and Carotene Content of Fresh and Frozen New Hampshire Berries. No. 92*

### Research Mimeographs

Bauer, G. N. *Changes in Income of New Hampshire Wholesale Dairy Farmers. No. 3*

### Other Scientific Publications

Keener, H. A., Percival, G. P., and Morrow, K. S. *A Study of Cobalt Deficiency in New Hampshire with Sheep.* Jour. Animal Sci. 7:16-25. 1948

Smith, W. W., Hodgdon, A. R., and Eggert, Russell. *Progress Report on Chemical Weed Control in Blueberry Fields.* Proc. Amer. Soc. Hort. Sci. 50:233-238. 1947

Slanetz, L. W., and Allen, F. E. *Penicillin Therapy in Streptoccal Mastitis.* Jour. Amer. Vet. Med. Assoc. CXI: 125-127. Aug. 1947

Yeager, A. F. *Breeding for Earliness in Vine Crops.* Proc. Amer. Soc. Hort. Sci. 50: 231-232. 1947

Yeager, A. F. *Plant Exploration at Home.* Proc. Amer. Soc. Hort. Sci. 50: 416-418. 1947

Latimer, L. P., and Percival, G. P. *Comparative Value of Sawdust, Hay, and Seaweed as Mulch for Apple Trees.* Proc. Amer. Soc. Hort. Sci. 50: 23-30. 1947

Teeri, A. E. *Thiamine and the Cyanogen Bromide Reaction.* Jour. Biolog. Chem. 173: 503-505, 1948

## NEW HAMPSHIRE AGRICULTURAL EXPERIMENT STATION STAFF
## 1948-49

### ADMINISTRATION

Arthur S. Adams, sc.d., President
Robert F. Chandler, Jr., ph.d., Dean and Director
Harold C. Grinnell, ph.d., Associate Dean and Associate Director
Raymond C. Magrath, Treasurer
Russell C. Smith, Purchasing Assistant
Walton E. Devine, Assistant Treasurer
Ella S. Bowles, Publications
Thelma Brackett, a.b., Librarian
Wilfred T. Harwood, Library Assistant in Charge, Plant and Animal Sciences Library

### AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Thomas G. Phillips, ph.d., Chemist
Todd O. Smith, m.s., Associate Chemist
Stanley R. Shimer, m.s., Assistant Chemist
Gordon P. Percival, m.s., Assistant Chemist
Helen J. Purinton, ph.d., Assistant Chemist
Arthur E. Teeri, ph.d., Assistant Chemist
Henry A. Davis, m.s., Assistant Chemist
Margaret Loughlin, a.b., Assistant in Agricultural and Biological Chemistry
Dorothy Josselyn, Assistant in Agricultural and Biological Chemistry
Shirley Roseman, b.s., Laboratory Assistant in Agricultural and Biological Chemistry

### AGRICULTURAL ECONOMICS

Harry C. Woodworth, m.s., Agricultural Economist
Winfred K. Burkett, ph.d., Associate Economist
Lawrence A. Dougherty, b.s., Assistant Agricultural Economist
James R. Bowring, ph.d., Assistant Agricultural Economist
John C. Holmes, a.b., Research Assistant in Agricultural Economics
Allen Atwood, Research Assistant in Agricultural Economics

### AGRICULTURAL ENGINEERING

George M. Foulkrod, m.s., Agricultural Engineer

### AGRONOMY

Ford S. Prince, b.s., Agronomist
Leroy J. Higgins, b.s., Associate Agronomist
Paul T. Blood, m.s., Assistant Agronomist
Louis T. Kardos, ph.d., Associate Agronomist
Reeshon Feuer, b.s., Soil Survey Assistant
Bessie G. Sanborn, Seed Analyst
William H. Mitchell, b.s., Graduate Assistant in Agronomy

### BACTERIOLOGY

Lawrence W. Slanetz, ph.d., Bacteriologist
Fred E. Allen, d.v.m., Veterinarian
Constance L. Rollins, b.s., Laboratory Instructor in Bacteriology
Charlotte H. Langley, b.s., Laboratory Assistant
Ralston Read, Jr., b.s., Graduate Assistant in Bacteriology

BOTANY

Albion R. Hodgdon, ph.d., Plant Taxonomist
Stuart Dunn, ph.d., Plant Physiologist
Mathias C. Richards, ph.d., Plant Pathologist
Leonard P. Wolfe, b.s., Graduate Assistant

DAIRY HUSBANDRY

Kenneth S. Morrow, m.s., Dairy Husbandman
Ernest G. Ritzman, m.s., Research Professor, Emeritus in Animal Husbandry
Harry A. Keener, ph.d., Associate Dairy Husbandman
Herbert C. Moore, m.s., Associate Dairy Husbandman
N. F. Colovos, m.s., Associate Animal Nutritionist
J. R. Prescott, b.s., Research Assistant in Dairy Husbandry

ENTOMOLOGY

James G. Conklin, ph.d., Entomologist
Walter C. O'Kane, d.sc., Entomologist
Robert L. Blickle, ph.d., Assistant Entomologist
Wallace J. Morse, b.s., Research Chemical Assistant in Entomology

FORESTRY

Clark L. Stevens, ph.d., Forester
Lewis C. Swain, m.f., Associate Forester

HOME ECONOMICS

Frances Platts, m.ed., Research Assistant in Home Economics

HORTICULTURE

Albert F. Yeager, ph.d., Horticulturist
E. J. Rasmussen, m.s., Research Associate in Horticulture
Elwyn M. Meader, m.s., Associate Horticulturist
L. Phelps Latimer, ph.d., Associate Horticulturist
William W. Smith, ph.d., Assistant Horticulturist
Russell Eggert, m.s., Supt. Horticultural Farm
Edward B. Risley, b.s., Greenhouse Superintendent
James Macfarlane, Greenhouse Assistant
Richard Foley, b.s., Graduate Assistant

POULTRY HUSBANDRY

T. Burr Charles, m.s., Poultry Husbandman
Richard Ringrose, ph.d., Assistant Poultry Husbandman
Fred E. Allen, d.v.m., Veterinarian
Alan C. Corbett, d.v.m., Pathologist
C. W. Hess, ph.d., Geneticist
George Faddoul, ph.d., Assistant Pathologist
E. T. Bardwell, R. O. P. Supervisor
C. F. Zoerb, Poultry Inspector
Richard Ford, Supervising Technician in Poultry Laboratory
Donald S. Cross, Senior Laboratory Technician in Poultry Husbandry
Kathryn Moore, Assistant Laboratory Technician in Poultry Husbandry
Virginia Lachance, Laboratory Technician in Poultry Husbandry

## CHANGES IN PERSONNEL

### Additions to Staff

Atwood, Allen, Research Assistant in Agricultural Economics, March 1, 1948
Bowring, James R., Assistant Agricultural Economist, February 16, 1948
Burkett, W. Keith, Associate Economist, April 1, 1948
Chandler, Robert F., Jr., Dean and Director, September 1, 1947
Colovos, Nicholos F., Associate Animal Nutritionist†
Eggert, Russell, Superintendent of Horticultural Farm, March 16, 1948
Elliott, R. T., Poultry Inspector, August 11, 1947
Faddoul, George, Assistant Pathologist, February 16, 1948
Helberg, Joan R., Graduate Assistant in Bacteriology, September 1, 1947
Hess, C. W., Geneticist, July 1, 1947
Joselyn, Dorothy, Assistant in Agricultural and Biological Chemistry, November 1, 1947
Macfarlane, James C., Laboratory Technician in Poultry Husbandry, October 6, 1947
Meader, E. M., Associate Horticulturist, February 16, 1948
Miller, Ian, Graduate Assistant in Bacteriology, July 1 - August 31, 1947; Assistant in Bacteriology, February 1 - June 30, 1948
Mitchell, William H., Graduate Assistant in Agronomy, July 1, 1947
Prescott, J. R., Research Assistant in Dairy Husbandry, September 1, 1947
Risley, Edward B., Greenhouse Superintendent, February 1, 1948
Rollins, Constance Ledward, Laboratory Technician in Bacteriology, September 25, 1947
Wight, Dorothy, Graduate Assistant in Bacteriology, February 1, 1948
Zoerb, Conrad, Poultry Inspector, December 1, 1947

### Losses from Staff

Ackerman, J. P., Laboratory Technician in Poultry Husbandry, September 30, 1947
Beij, Pierce, Graduate Assistant in Horticulture, June 30, 1948
Bredo, William, Assistant Agricultural Economist, December 31, 1947
Calahan, C. Lyman, Horticultural Farm and Greenhouse Superintendent, November 26, 1947
Eastman, M. Gale, Dean and Director, January 31, 1948 (Retirement)
Elliott, R. T., Poultry Inspector, September 30, 1947
Helberg, Joan R., Graduate Assistant in Bacteriology, January 31, 1948
Macfarlane, James C., Laboratory Technician in Poultry Husbandry, May 31, 1948
Moorenovitch, Peter, Greenhouse Foreman, June 30, 1948
Richards, Lillian, Laboratory Technician in Bacteriology, July 31, 1947
Rinta, Ruth E., Assistant Laboratory Technician in Poultry Husbandry, January 31, 1948
Rollins, Constance Ledward, Laboratory Technician in Bacteriology, June 5, 1948
Wight, Dorothy, Graduate Assistant in Bacteriology, June 30, 1948

†Returned to duties on April 1, 1948 after an extended leave of absence.